Evaluation of ^{238}Pu, ^{240}Pu, ^{242}Pu decay data

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High-quality and critically evaluated decay data for uranium and transuranium isotopes are needed in order to determine their concentrations in nuclear fuel and related materials, for safeguards, environmental monitoring, radioactive waste management, dosimetry, nuclear medicine and for other applications. This information was provided by the International Atomic Energy Agency ("Decay Data of the Transactinium Nuclides", Technical Reports Series No. 261, IAEA Vienna, 1986) over 15 years ago. As expected, during this period the number and quality of measurements has dramatically improved, and therefore a re-evaluation is highly desirable and fully warranted.

This evaluation of decay data of three even-even plutonium isotopes takes into account experimental data and other information (compilations, calculations, evaluations) published until 2003. The evaluated values have been obtained using the approaches, programs and procedures adopted by the Decay Data Evaluation Project collaboration.

The following decay data of ^{238}Pu, ^{240}Pu, ^{242}Pu have been evaluated: half-life, decay energy, energy and probability of alpha-transitions, energy and probability of gamma-transitions, internal conversion coefficients of gamma-transitions, energy and relative and absolute emission probability of gamma-rays, energy and absolute emission probability of X-rays, energy and absolute emission probability of electrons.

The evaluated values of the most intensive gamma-ray absolute emission probabilities are the following ones (photons per 100 disintegrations): ^{238}Pu (43.50 keV) - 0.0397(8), ^{240}Pu (45.24 keV) - 0.0450(9), ^{242}Pu (44.92 keV) - 0.0375(8).

The evaluated values of the total U LX-ray absolute emission probabilities (photons per 100 disintegrations) in the decays of ^{238}Pu, ^{240}Pu and ^{242}Pu, respectively: 10.63(8), 10.34(15) and 8.5(4).

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